Repeated Oestrus Synchrony and Fixed Time AI in Beef Cows at Pasture

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Abstract

The feasibility of breeding spring calving, single-suckled beef cows without the use of natural service was explored over two breeding seasons using repeated oestrus synchrony and fixed-time AI. Initially, cows were oestrus synchronised using subcutaneous norgestomet implants inserted for ten days with prostaglandin injection prior to implant removal. Cows were inseminated once, 56 hours after implant removal and 12 days later all cows were re-treated with norgestomet implants to allow a second synchronised service. Twenty-one days after the first synchronised AI, milk samples were drawn for progesterone assay and the norgestomet implants removed. Cows received a second service 56 hours later if the 21 day milk progesterone assay suggested they were not pregnant. All cows receiving a second service were re-treated with norgestomet implants as before to allow a third synchronised service as necessary. Pregnancy was later confirmed by manual rectal palpation. In year one, 48 cows entered the program and the pregnancy rates to the first, second and third synchronised services were 56%, 69% and 40% respectively with 17% of cows barren at the end of the breeding period. In year two, 69 cows entered the program and the pregnancy rates were 58%, 48% and 33% to each service with 20% of cows barren at the end of the breeding period. The accuracy of milk progesterone assay for pregnancy diagnosis was 84% and 87% in years 1 and 2 respectively. The study showed it is possible to achieve a calving rate of at least 80% following a 46 day breeding period using a combination of oestrus synchrony and fixed-time AI in beef cows at pasture.

Keywords: oestrus synchrony, AI, beef cows, norgestomet

Introduction

The use of artificial insemination (AI) in commercial beef suckler herds is desirable as it allows the use of best linear unbiased prediction (BLUP) tested sires to maximise the quality of the calf crop. Use of synchronised AI also can allow all cows to be bred on day one of the mating season thus producing a more compact calving pattern than that achieved with natural service. The use of AI in beef herds also can eliminate the risks of venereally transmitted diseases such as *campylobacter fetus* infection. Because of the problems associated with accurate heat detection in beef cows especially during summer grazing, the use of AI is often limited to one synchronised service with fixed time AI followed by natural service for the cows that return to the AI. This system requires bulls to be maintained as sweepers or requires bulls to be hired for the mating period which carries major disease risks. To eliminate the cost of maintaining sweeper bulls it would be desirable to carry out all services following oestrus synchrony with fixed time AI. The objective of this study was to assess the effectiveness of a breeding protocol using a combination of repeated oestrus synchrony with norgestomet implants, fixed-time AI and pregnancy diagnosis using milk progesterone assay in commercial beef cows. The protocol gave cows the opportunity for up to three services over a 46 day mating period with no natural service being used.

Materials and Methods

All the cows used in this study were part of the Scottish Agricultural College's spring calving beef suckler herd of Hereford x Friesian and Limousin x Friesian cows. Cows calved indoors during April/May and were fed ad libitum grass silage and 2.5kg concentrates/cow/day until turnout. The study was carried out over two breeding seasons and the nutritional management of the cows was similar for both years. In year 1, forty-eight cows of mixed parity were used in the protocol and in year two, 69 cows all of which were suckling a single calf at the time of breeding.

Breeding protocol

The breeding protocol is summarised in Table 1 and was identical for both years. Day zero was taken as

Presented at the XIX World Buiatrics Congress, Edinburgh, Scotland, July 8-12, 1996.

Table 1. Summary of oestrus synchronisation and breeding protocol.

Day	Procedure
-12	Insert crestar implants
-4	Inject prostaglandin
-2	Remove crestar implants ± PMSG
0	First AI
12	Insert crestar implants
21	Remove crestar implants, take milk samples
23	Second AI if milk progesterone <3.5ng/ml
35	Insert crestar implants
44	Remove crestar implants, take milk samples
46	Third AI if milk progesterone <3.5ng/ml

the day of the first synchronised service in the mating period. At the start of the mating program (day -12) all cows were weighed, condition scored using a range of 1 to 5 (Lowman, Scott and Somerville 1976) and oestrus synchronised using implants containing 3mg norgestomet (Crestar, Intervet UK Ltd) inserted subcutaneously in the base of the ear. At the same time all cows were given an intramuscular injection containing 3mg norgestomet and 5mg oestradiol valerate (Crestar injection, Intervet UK Ltd). Eight days later (day -4) all cows were injected with 15mg luprostiol (Prosolvin, Intervet UK Ltd), a synthetic prostaglandin analogue and the norgestomet ear implants were removed 10 days after insertion (day -2). Cows calved less than 55 days or condition score 2 or less at this time were given an intramuscular injection of 400iu PMSG. Cows were inseminated once, 56 hours after implant removal using frozen semen from a proven Charolais or Simmental Scottish Milk Marketing Board bull (day zero). On day 12 all cows were re-implanted with norgestomet ear implants which were removed 9 days later (day 21) and at this time milk samples were taken for progesterone analysis. Any cow with a milk progesterone concentration of >5ng/ml was assumed to be pregnant and was not inseminated again. Cows with milk progesterone concentrations of <3.5ng/ml were inseminated once, 56 hours after implant removal (day 23). Cows with milk progesterone concentrations of between 3.5 and 5ng/ml were only inseminated if they showed signs of oestrus behaviour on day 23. All cows which had received a second insemination were re-implanted with norgestomet ear implants on day 35 and these were removed nine days later (day 44) at which time milk samples were collected for progesterone analysis. Cows with low milk progesterone levels were inseminated as above, 56 hours after implant removal (day 46).

Milk progesterone analysis

Milk samples were drawn by hand into individual universal containers containing a preservative tablet and progesterone levels were assayed within 24 hours using a quantitative ELISA test kit (Ovucheck, Cambridge Veterinary Sciences Ltd).

Pregnancy diagnosis

Pregnancy was confirmed by rectal palpation approximately eight weeks after the end of the breeding program.

Results

In year one, 48 cows entered the triple synchrony program and on day zero the median number of days post-calving was 77 (range 32 to 89). Eleven cows (23%) were given PMSG before the first service and the calving rate to the first service was 56% (27/48). Sixteen cows were inseminated a second time and the calving rate to this service was 69% (11/16). Five cows received a third service and the calving rate to this service was 40% (2/5). The combined calving rate to all services was 58% (40/69). At pregnancy diagnosis 17% (8/48) were barren.

In year two, 69 cows entered the triple synchrony program and on day zero the median number of days post-calving was 80 (range 46 to 124). Thirty two cows (46%) were given PMSG before the first service and the calving rate to the first service was 58% (40/69). Twenty three cows were inseminated a second time and the calving rate to this service was 48% (11/23). Twelve cows received a third service and the calving rate to this service was 33% (4/12). The combined calving rate to all services was 53% (55/104). At pregnancy diagnosis 20% (14/69) were barren.

Table 2. The results of triple synchrony breeding program over two years

	Year one	Year two
Pregnancy rate to 1st AI	56% (27/48)	58% (40/69)
Pregnancy rate to 2nd AI	69% (11/16)	48% (11/23)
Pregnancy rate to 3rd AI	40% (2/5)	33% (4/12)
Pregnancy rate to all services	58% (40/69)	53% (55/104)
Barren rate	17% (8/48)	20% (14/69)

Accuracy of milk progesterone for pregnancy diagnosis

In year one the accuracy of milk progesterone for predicting pregnancy at 21 days post service was 84% (27/32) for the first service and 100% (11/11) for the second service. Of the 5 cows which gave false positive results, 4 had milk progesterone concentrations of 3.5-

5ng/ml and one had a value of 19ng/ml on the day of sampling. In year two the accuracy was 87% (40/46) for the first service and 100% (11/11) for the second service. All 6 cows which gave false positive results had milk progesterone concentrations of >13ng/ml at the time of sampling.

Discussion

The results of this study demonstrate that in beef suckler cows at pasture it is possible to achieve a calving rate of at least 80% following a restricted breeding period of 46 days using repeated oestrus synchrony and fixed time AI. Using natural service, assuming all cows were cyclical at the start of the breeding period and the pregnancy rate to each service was 60%, it would theoretically be possible to achieve a calving rate of 84% following a 46 day breeding period (Mossman and Hanly 1977). In practice these results are seldom achieved with natural service and restricted breeding periods in beef herds, due to prolonged post partum anoestrus in some cows and sub-optimal bull fertility.

The main problem encountered with this scheme was the high barren rate at the end of the breeding period in each year. Many of the barren cows were assumed to be pregnant on the basis of milk progesterone assays done after the first AI which excluded them from further services. Overall, the accuracy of 21 day milk progesterone assay for predicting pregnancy after the first service was 86% which is similar to the accuracy commonly quoted for milk progesterone pregnancy diagnosis at this time (Sasser and Ruder 1987). The possible reasons for false positive results in this study include: late embryonic death, and sampling during the luteal phase of the cycle in non pregnant cows. The treatment with prostaglandin at day -4 reduced the chances of false positives being due to luteal cysts or persistent CL but cows could be in the luteal phase 21 days after the first AI for several other reasons. If cows short cycle after the first induced oestrus in the program then it is quite likely that they will be in high progesterone phase of the next cycle when milk samples are taken for progesterone analysis at day 21 after AI. The incidence of short cycles in beef cows following the first postpartum ovulation has been shown to be as high as 78% (Murphy, Boland and Roche 1990) and although progesterone treatment prior to the first post partum ovulation has been shown to reduce this incidence (Roche, Crowe and Boland 1992), this effect may not be seen with norgestomet. Some anoestrus cows may not have ovulated following the first synchronisation but subsequently ovulated naturally in the 2 weeks after the first AI which would again lead to false positives at the 21 day milk progesterone pregnancy diagnosis. The occurrence of false positives appears to be reduced at the second service milk progesterone test as in this study the accuracy was 100% in both years. Short cycles after the second AI are less likely as they normally occur only after the first post-partum ovulation. To reduce the incidence of false positives due to short cycles after the first AI it is important that the majority of cows are cyclical before the first synchronisation is commenced, which will be related to the time post-calving and nutritional management of the cows. A proportion of the false positive results may have been as a result of late embryonic death (LED), the incidence of which may vary from 3-8% (Kastelic, Northey and Ginther 1991; Sreenan and Diskin 1986), but in this study it was not possible to speculate on the proportion of false positives caused by LED.

This study demonstrates it is possible to achieve a calving rate of 80% or greater following a 46 day breeding period using repeated synchrony and fixed-time AI in spring calving beef cows at pasture. The system requires good handling facilities and amenable cows and has limitations due to the incidence of false positive results using milk progesterone assay for pregnancy diagnosis.

Acknowledgments

The authors thank Intervet UK Ltd for technical and financial assistance.

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